

CLAIMS

WHAT IS CLAIMED IS:

1. A cylindrical ultrasound transducer comprising:
a cylindrical inner electrode;
5 a cylindrical piezoelectric material disposed over the inner electrode; and
a cylindrical outer electrode disposed over the cylindrical piezoelectric material,
the cylindrical outer electrode having spiral grooves separating the outer electrode into a
plurality of discrete helical elements.
- 10 2. The cylindrical ultrasound transducer of claim 1 wherein the inner electrode
comprises a metallic layer.
3. The cylindrical ultrasound transducer of claim 2 wherein the metallic layer
comprises Nickel.
- 15 4. The cylindrical ultrasound transducer of claim 2 wherein the metallic layer
comprises Gold.
5. The cylindrical ultrasound transducer of claim 1 wherein the cylindrical
20 piezoelectric material comprises a high-density fine grain PZT ceramic material.
6. The cylindrical ultrasound transducer of claim 1 wherein the cylindrical
piezoelectric material is polished to a mirror finish of approximately 10 microns.

7. The cylindrical ultrasound transducer of claim 1 wherein the outer electrode comprises a metallic layer.
- 5 8. The cylindrical ultrasound transducer of claim 7 wherein the metallic layer comprises Nickel.
9. The cylindrical ultrasound transducer of claim 7 wherein the metallic layer comprises Gold.
- 10 10. The cylindrical ultrasound transducer of claim 1 wherein the discrete helical elements are intertwined.
11. The cylindrical ultrasound transducer of claim 1 wherein the spiral grooves
15 further separate the piezoelectric material into a plurality of substantially discrete zones.
12. The cylindrical ultrasound transducer of claim 11 wherein the zones are helically shaped and intertwined.
- 20 13. The cylindrical ultrasound transducer of claim 1 further comprising a matching layer disposed over the outer electrode.

14. The cylindrical ultrasound transducer of claim 13 wherein the matching layer fills the grooves.
15. The cylindrical ultrasound transducer of claim 13 wherein the matching layer comprises a low viscosity polymer.
16. The cylindrical ultrasound transducer of claim 13 wherein the polymer is an epoxy adhesive.
- 10 17. A cylindrical ultrasound transducer comprising:
a cylindrical inner electrode;
a cylindrical piezoelectric material disposed over the inner electrode;
a cylindrical outer electrode disposed over the cylindrical piezoelectric material;
and
15 spiral grooves cut through the outer electrode and at least a portion of the cylindrical piezoelectric material, the spiral grooves separating the transducer into a plurality of functionally discrete helical transducer segments.
- 18 An ablation element comprising a plurality of intertwined helical transducers
20 arranged linearly along a longitudinal axis.

19. An ablation element comprising an ultrasonic transducer segmented into a plurality of functionally discrete intertwined helical transducer segments arranged linearly along a longitudinal axis.

5 20. An ablation catheter assembly for ablating a region of tissue in a body space comprising:

an elongate delivery member having a proximal end portion and a distal end portion;

an anchor mechanism coupled to the distal end portion of the elongate delivery member, the anchor mechanism being adapted to engage a substantial portion of tissue in

10 the body space;

and an ablation element secured to the distal end portion of the elongate delivery member, the ablation element having an ultrasonic transducer segmented into a plurality of functionally discrete intertwined helical transducer segments arranged linearly along a longitudinal axis.

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